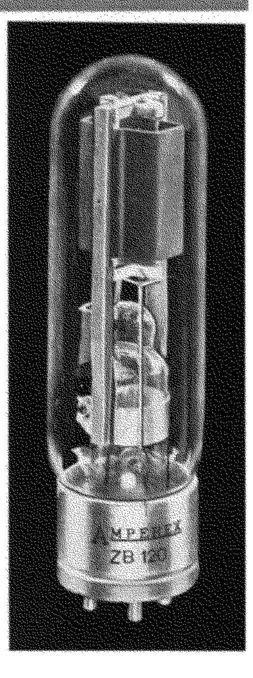
AMPEREX TRANSMITTING TUBE ZB-120

Low Distortion Zero-Bias Class B Amplifier and Modulator, High Efficiency R.F. Frequency Multiplying Power Amplifier, Conventional R.F. Power Amplifier



The ZB-120 is an exclusive Amperex development. In common with other tubes of original Amperex design it is a low voltage high current type and possesses a high ratio of transconductance to interelectrode capacitance. Although it approaches nearer the ideal in a zero-bias class B tube it is also a highly efficient performer in many other classes of service.

MAXIMUM RATINGS AND TYPICAL OPERATING CONDITIONS

Audio Frequency Power Amplifier or Modulator—Class B

	Maximum Rating per Tube	Typical Operation Two Tubes			
A.C. Filament Voltage	..	10	10	10	10
D.C. Plate Voltage	1500	750	1000	1250	1500
D.C. Grid Voltage	..	0	0	0	—9
Load Resistance (per tube) (ohms)	..	1200	1725	2250	2800
Effective Load Resistance (plate to plate) (ohms)	..	4800	6900	9000	11200
Zero Signal Plate Current (ma.)	..	50	70	95	60
Peak A.F. Grid to Grid Voltage	..	190	190	180	196
Max. Signal D.C. Plate Current (ma.)	160	320	310	300	296
Max. Allowable Average Plate Dissipation (watts)	75	..	..	..	..
Max. Signal Driving Power (Approx.) (watts)	..	5	5	4	5
Max. Signal Power Output (watts)	..	150	200	245	300

(Zero-Bias) R.F. Power Amplifier—Class B Telegraphy

(Key down conditions per tube without modulation)

	Maximum Rating per Tube	Typical Operation One Tube	
A.C. Filament Voltage	..	10.0	10.0
D.C. Plate Voltage	1250	1000	1250
D.C. Grid Voltage	..	0	0
Peak R.F. Grid Voltage	..	95	90
D.C. Plate Current (ma.)	160	155	150
D.C. Grid Current (ma.)	40	25	21
Plate Input (watts)	200	155	187
Plate Dissipation (watts)	75	55	67
Driving Power (watts)	..	1.5	1.2
Plate Power Output (watts)	..	100	120
Frequency Limit for Above Operation (mc.)	30	..	..

R.F. Power Amplifier—Class B—Telephony

(Carrier conditions for use with a maximum modulation factor of 1.0)

	Maximum Rating per Tube	Typical Operation One Tube
A.C. Filament Voltage	..	10
D.C. Plate Voltage	1250	1250
D.C. Grid Voltage	..	0
Peak R.F. Grid Voltage	..	55
D.C. Plate Current (ma.)	100	95
D.C. Grid Current (ma.)	..	8
Plate Input (watts)	120	118
Plate Dissipation (watts)	75	73
Grid Driving Power at Modulation Peak (watts)	..	1.5
Plate Power Output (watts)	..	45
Frequency Limit for Above Operation (mc.)	30	..

GENERAL CHARACTERISTICS

Filament:	
Voltage	10-10.5 volts A.C. or D.C.
Current	2.5 amperes
Amplification Factor	90
Grid to Plate Transconductance at 120 ma.	5000 micromhos
Direct Interelectrode Capacitances:	
Grid to Plate	5.2 $\mu\mu f$
Grid to Filament	5.3 $\mu\mu f$
Plate to Filament	3.2 $\mu\mu f$

*R.F. Power Amplifier—Class C—Telegraphy

(Key down conditions per tube without modulation)

	Maximum Rating per Tube	Typical Operation One Tube			
A.C. Filament Voltage	..	10.5	10.0	10.0	10.5
D.C. Plate Voltage	1250	750	1000	1250	1250
D.C. Grid Voltage	—400	—80	—90	—90	—135
or Grid Resistor (ohms)	..	2750	4000	5000	6000
Peak R.F. Grid Voltage	..	200	205	200	260
D.C. Plate Current (ma.)	160	160	150	150	160
Plate Input (watts)	200	120	150	187	190
D.C. Grid Current (ma.)	40	29	23	18	23
Plate Dissipation (watts)	75	35	40	47	55
Driving Power (watts)	..	5.2	4.2	3	5.5
Plate Power Output (watts)	..	85	110	130	145
Frequency Limit for Above Operation (mc.)	30	..	..	..	..

*The ZB-120 is not recommended for use as a self-excited oscillator, if the service involves variable loading of the tube.

Plate Modulated R.F. Power Amplifier Class C—Telephony

(Carrier conditions for use with a maximum modulation factor of 1.0)

	Maximum Rating per Tube	Typical Operation One Tube	
A.C. Filament Voltage	..	10.5	10.5
D.C. Plate Voltage	1000	750	1000
Grid Resistor* (ohms)	..	4500	7000
D.C. Grid Voltage	—400	..	..
Peak R.F. Grid Voltage	..	200	250
D.C. Plate Current (ma.)	120	120	120
Plate Input (watts)	120	90	120
D.C. Grid Current (ma.)	40	22	21
Plate Dissipation (watts)	50	35	25
Driving Power (watts)	..	4	5
Plate Power Output (watts)	..	65	95
Frequency Limit for Above Operation (mc.)	30	..	..

*For minimum modulation distortion, the required grid bias should be obtained with grid resistors of the specified values.

AMPEREX

ZB-120

Grid Modulated R.F. Power Amplifier Class C

(Carrier conditions for use with a maximum modulation factor of 1.0)

	Maximum Rating per Tube	Typical Operation One Tube
A.C. Filament Voltage	..	10
D.C. Plate Voltage	1250	1250
D.C. Grid Voltage		
From Fixed Bias Supply	–400	–80
Peak R.F. Grid Voltage	..	150
Peak A.F. Grid Voltage	..	70
D.C. Plate Current (ma.)	100	90
Plate Input (watts)	120	112
D.C. Grid Current (Approx.) (ma.)	..	7
Plate Dissipation (watts)	75	70
Grid Driving Power at Modulation Peak (watts)	..	1.6
Plate Power Output (watts)	..	42
Frequency Limit for Above Operation (mc.)	30	..

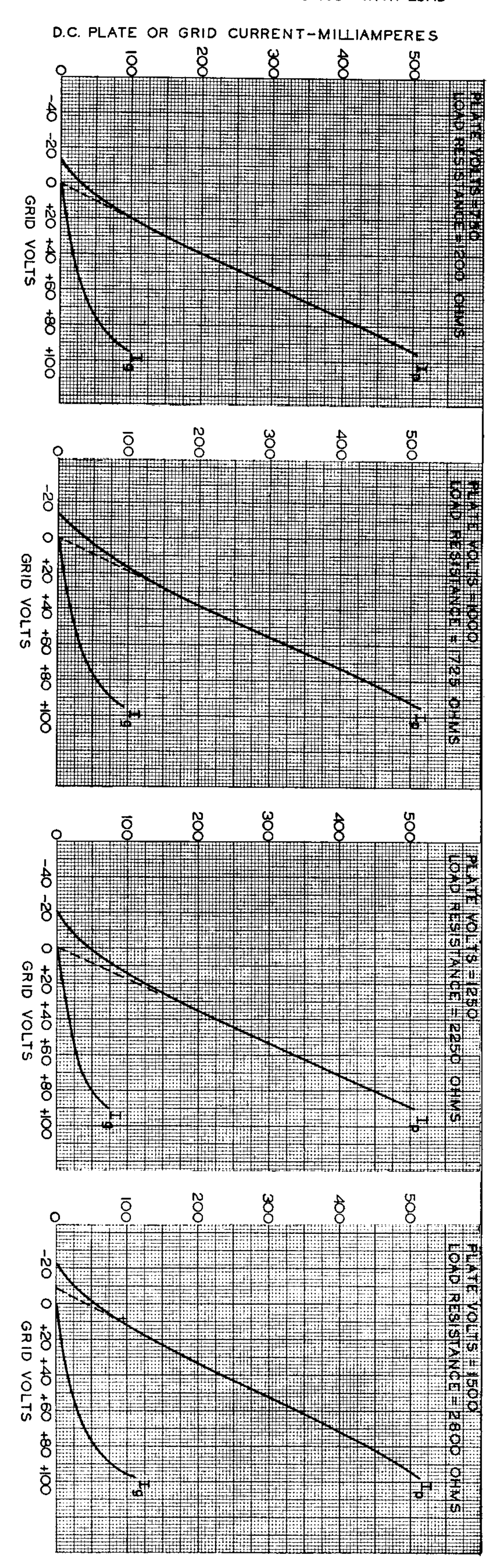
R.F. Frequency Doubling Power Amplifier Telegraphy

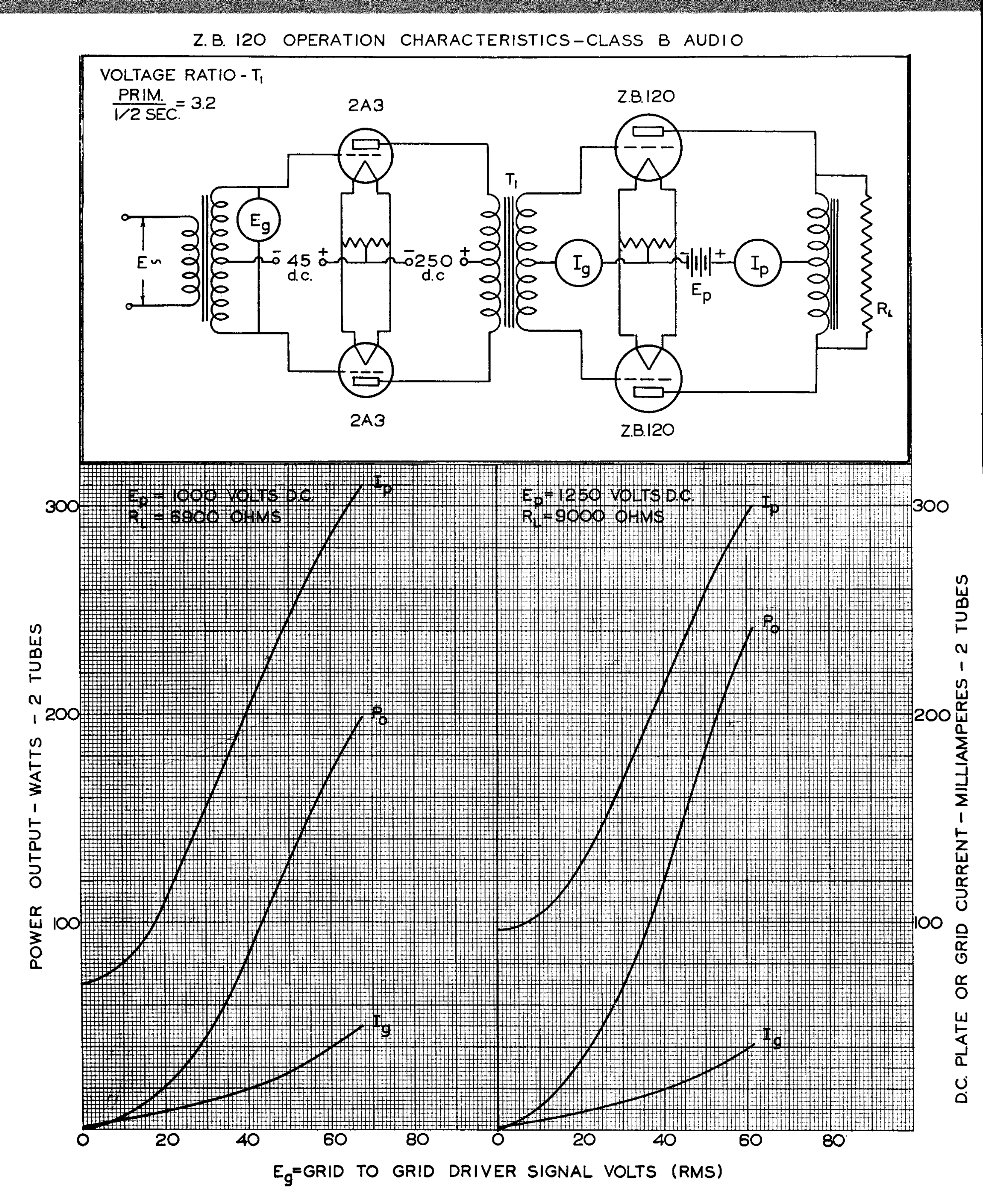
	Maximum Rating per Tube	Typical Operation One Tube
A.C. Filament Voltage	..	10.5
D.C. Plate Voltage	1250	1250
D.C. Grid Voltage	–400	–300
Peak R.F. Grid Voltage	500	430
D.C. Plate Current (ma.)	140	138
Plate Input (watts)	175	172
D.C. Grid Current (ma.)	30	16
Plate Dissipation (watts)	75	33
Driving Power (watts)	..	7
Plate Power Output (at Doubled Frequency) (watts)	..	105
Driving Frequency Limit for Above Operation (mc.)	15	..

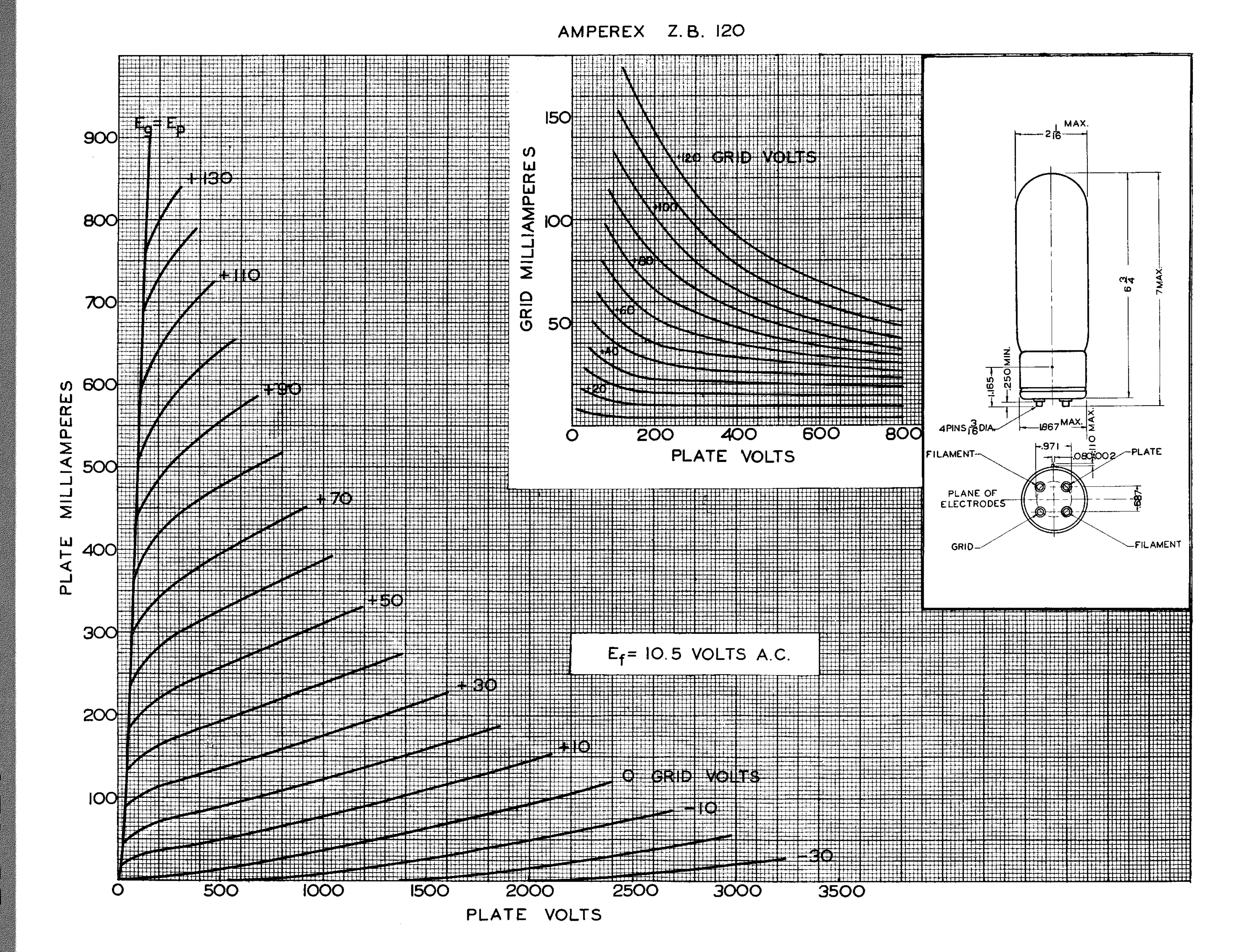
Grid Modulated R.F. Frequency Doubling Power Amplifier—Telephony

(Carrier conditions for use with a maximum modulation factor of .8)

	Maximum Rating per Tube	Typical Operation One Tube
A.C. Filament Voltage	..	10.5
D.C. Plate Voltage	1250	1250
D.C. Grid Voltage (from Fixed Bias Supply)	–400	–330
Peak R.F. Grid Voltage	..	430
Peak A.F. Grid Voltage	..	80
D.C. Plate Current (ma.)	100	95
Plate Input (watts)	120	118
D.C. Grid Current (ma.)	..	6.5
Plate Dissipation (watts)	75	73
Grid Driving Power at Modulation Peak (watts)	..	7
Plate Power Output (watts)	..	45
Driving Frequency Limit for Above Operation (mc.)	15	..




Z. B. 120 OPERATION CHARACTERISTICS – CLASS B AUDIO
VOLTAGE RATIO - T1
PRIM. / 1/2 SEC. = 3.2
2A3
Z.B.120
T1
Eg
Es
45 d.c.
250 d.c
Ig
Ep
Ip
RL
Ep = 1000 VOLTS D.C.
RL = 6900 OHMS
Ep = 1250 VOLTS D.C.
RL = 9000 OHMS
Ip
Po
Ig
POWER OUTPUT - WATTS - 2 TUBES
D.C. PLATE OR GRID CURRENT - MILLIAMPERES - 2 TUBES
300
200
100
0
20
40
60
80
Eg = GRID TO GRID DRIVER SIGNAL VOLTS (RMS)


AMPEREX Z.B. 120
PLATE MILLIAMPERES
100
200
300
400
500
600
700
800
900
0
500
1000
1500
2000
2500
3000
3500
PLATE VOLTS
Eg = Ep
+130
+110
+90
+70
+50
+30
+10
0 GRID VOLTS
-10
-30
Ef = 10.5 VOLTS A.C.
GRID MILLIAMPERES
50
100
150
0
200
400
600
800
PLATE VOLTS
+20
+40
+60
+80
+100
+120 GRID VOLTS
2 1/16 MAX.
6 3/4
7 MAX.
1.165
.250 MIN.
4 PINS 3/16 DIA.
1.867 MAX.
.110 MAX.
.971
.080±.002
FILAMENT
PLATE
PLANE OF ELECTRODES
.687
GRID
FILAMENT